Light and Lighting

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Lighting the Homes of the Million

THIS would also have served for a title for Mr. Carne's recent paper (see pp. 50-51)—for it is the homes of the masses, people with incomes below £3 a week, with which he is concerned.

Here we have the crucial problem affecting Codes and Recommendations, Are we to specify what is ideal or what is practicable—what we think we ought to have or what we are likely to get?

Evidently people with such small means will not readily spend even an additional shilling a week in order to meet the demand of the I.E.S. Code—though Mr. Carne is at pains to suggest how this can be done in the most economical way.

We must confess we have a good deal of sympathy with those who claim that good lighting, on the moderate scale set out in the I.E.S. Code, should be available for everyone—just as readily as pure water, ventilation, and sanitary requirements. Is it not the ultimate business of the community to see that this at least is available?

Illuminating Engineering in Australia

We notice in *Illuminating Engineering* (U.S.A.) some account of the activities of the Australian I.E.S., and in the last copy of the I.E.S. Lighting Review (Australia) to reach us some further particulars are given. The three main societies, now affiliated under a Federal Council, are located in New South Wales, Victoria, and South Australia, with a joint membership of about 350. But, in addition, "Chapters" have been formed in Tasmania; these are now holding meetings and evidently getting into their stride. A feature of the societies has been the formation of numerous committees, under which the affairs of the Society are managed and a considerable amount of technical work is being done. The influence of the Australian societies has been reflected in the Australian Industrial Lighting Regulations, now in operation, and lighting developments in the post-war period are also being studied. It is interesting to observe that the Australian I.E.S., like our own, has adopted the distinction of Fellowship. It is stated that the use of the letters F.I.E.S. will not be sanctioned in Australia for some years to come.

Domestic Lighting

An enterprising step was taken on April 13 by the Cardiff Centre, which extended a special invitation to members of the E.A.W. and the Training College of Domestic Arts to hear a lecture on Domestic Lighting by Mr. D. C. James. Lady Lewis, who was present, expressed a wish for closer co-operation with the I.E.S., and we gather there is a prospect of some of the ladies present joining the Society. They would doubtless be very welcome. There is a prospect of another meeting of the same kind in September, when I.E.S. members will be called upon to serve as a species of Brains Trust and to answer knotty questions on lighting problems.

Essay Competition in Birmingham

The I.E.S. President (Dr. Buckley) visited the Birmingham Centre on April 21, when he repeated his address on Photometric Researches of the XVIIIth Century. A pleasant incident was the distribution by him of prizes to the winners of the Essay Competition sponsored by the Centre, open to students of technical schools in the vicinity. The subject on this occasion was "My Views on Artificial Light." The first and second prizes were gained by K. M. Poole, of Old Hill Technical School, and J. E. R. Dyson, of Rugby Technical College. Certificates were also awarded to five other students in the "Honourable Mention" class.

New I.E.S. Group in Stockton-on-Tees

Readers will be interested to learn that yet another I.E.S. Group, in the Stockton-on-Tees district, and under the aegis of the Newcastle-on-Tyne centre, has just been formed. The Group starts under favourable auspices with an initial membership of about thirty. We understand that the first meeting is being held during the present month, when Mr. Stuart Lay, the honorary secretary of the Newcastle Centre, is to repeat his address on "Lighting for Production," which was given before that Centre some time ago.

I.E.S. Code—New Edition

A new edition of the familiar I.E.S. Code is now in preparation. We gather that the chief change is in the values of illumination prescribed for school lighting (p. 7). There has been a feeling for some time that the values cited in the Code were on the low side (being, for example, less than those recommended in the Board of Education grey booklet issued some time before the outbreak of war). One may anticipate that, at least for new schools put up during the post-war period, values considerably higher than those regarded as sufficient in the past will become the rule.

The edition now in hand is merely a reprint of the Code in its familiar form. We have still to wait for the more fundamental changes, on which an I.E.S. committee has been actively at work, both before and after Mr. Weston's familiar paper on this subject.*

* Proposals for a New Lighting Code. Trans. Illum. Eng. Soc. (Lond.), Feb., 1943.

Forthcoming I.E.S. Meetings

(Provisional List)

SESSIONAL MEETINGS IN LONDON

1944.

May 9th. Annual General Meeting. Address by Sir Charles Darwin (Director of the National Physical Laboratory). *(The Meeting will be held in the Lecture Theatre, Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1.)* **5 p.m.**

MEETINGS OF CENTRES AND GROUPS

1944.

May 1st. Second General Meeting. Followed by an Address. *(Meeting of the Bath and Bristol Centre, to be held at the Grand Hotel, Broad Street, Bristol.)* **7 p.m.**

May 1st. Annual General Meeting. Address by The President. *(Meeting of the Leeds Centre, to be held in the Leeds Corporation Electricity Showrooms, The Headrow, Leeds.)* **5.15 p.m.**

May 2nd. Mr. T. S. Jones on **The Future Development in Electric Lighting Technique.** *(Meeting of the Derby Group, to be held in the Borough of Derby Electricity Showrooms, Irongate, Derby.)* **6 p.m.**

May 2nd. Mr. W. R. Stevens on **The Application of Low-Pressure Fluorescent Lamps.** *(Meeting of the Leicester Group, to be held in the Leicester Corporation Electricity Department, Demonstration Theatre, Charles Street, Leicester.)* **6 p.m.**

May 5th. Address by The President. *(Meeting of the Cardiff Centre, to be held in the Physics and Chemistry Lecture Theatre, University College, Cathays Park, Cardiff.)* **3 p.m.**

May 8th. Mr. J. W. Howell on **Special Lighting Problems with Particular Reference to Industry.** *(Meeting of the Sheffield Centre, to be held in the Central Library, Tudor Place, Sheffield.)* **6 p.m.**

May 19th. Dr. James F. Brailsford on **Light as an Aid to Medicine.** *(Meeting of the Birmingham Centre, to be held at the Imperial Hotel, Temple Street, Birmingham.)* **6 p.m.**

June 6th. Mr. J. W. Howell on **Lighting in Industry.** *(Meeting of the Leicester Group, to be held in the Leicester Corporation Electrtcity Department, Demonstration Theatre, Charles Street, Leicester.)* **6 p.m.**

Secretaries of Centres and Groups are requested to send in, as soon as available, particulars of any modifications in or additions to the revised List of Meetings for the Session as reprinted, in revised form, from the Transactions (December, 1943).

Lighting the Homes of To-morrow

(Proceedings at the I.E.S. Sessional Meeting held in London on March 14, when Mr. J. B. Carne's paper on the above subject was read.)

In discussing the above subject on March 14, Mr. J. B. Carne recalled that a number of papers on domestic lighting had been read before the Society in the past. It seemed, however, that insufficient attention had been paid *to the lighting of homes in which economy was a dominant factor*, which in practice represents the great majority.

In this connection he reproduced a quotation from a book written by Richard Elsom in 1816, who urged that "now that the blessings of peace are restored to these happy isles" efforts should be made to improve the conditions of the poor and particularly the "miserable state of their habitations."

How Much to Spend on Lighting?

In 1843 there was some organised effort towards slum clearance, and during subsequent years much attention has been given to rehousing. Now, when the building of four million homes after the war and the reconditioning of eight million more is visualised, and when "Codes of Practice" are in process of development, is the moment to consider standards of lighting for the future.

Mr. Carne next quoted some instructive figures from social surveys showing the average income and average amount (approx. £3—£4 per week) and the average consumption on heating, light and fuel (approx. 4s. to 6s.) per annum. Confirmatory data indicate an average consumption expenditure on lighting of less than one shilling—only, in fact, a little over 9d. per week.

The Value of Light Surroundings

This being so, it is of importance to consider how the light can be most efficiently utilised. In this connection Mr. Carne emphasised the great value of light-coloured decorations and the drawbacks of "gravy colours" which may reflect only 15 per cent. of light. It is well to remember, too, that the influence of surroundings on the lighting is greatest in the case of relatively small rooms, such as those we are now considering. He quoted figures to show that by adopting light colours for both walls and ceilings an increase in illumination on the table of 50 per cent. might be obtained, and remarked that even the light reflected from a light-coloured floor was by no means negligible.

The Design of Domestic Units

Turning to the design of units Mr. Carne showed an amusing picture of an early Victorian interior, in which utility had been largely sacrificed to useless ornamentation and quoted Ruskin's dictum, "Truth first—plan or design founded thereon." In adopting this basis of design we have to satisfy two main characteristics, "functionalism" and "efficiency." In this connection the author showed a series of photographs of installations in small rooms, where relatively good lighting conditions were very economically obtained by means of centrally placed units—those of a diffusing type having an aperture to emit direct light on the table being particularly successful. Tabular data for a room 14 ft. 6 in. x 16 ft. x 8t. 8 in. lighted by a central unit giving 1,850 lumens showed working illuminations ranging from 2.5 ft.c. with general lighting to nearly 6 ft.c. with direct lighting. They also illustrated the substantial

improvement secured when reflection factors of the order of 60 per cent. for walls and 75 per cent. for ceilings were adopted. The substitution of these lighter colours gave rise to increases in illumination of 10 to 22 per cent., according to the mode of lighting, in the case of ceilings, and 4 to 14 per cent. in the case of walls. In addition to the gain in illumination, however, the improved visual effect is of great importance.

The cost ratio of "direct," "general," and "indirect" lighting might be assessed in the ratio of 1: 1.2; 1.75—allowing some adjustment for the advantages of "quality."

Can the I.E.S. Code be Realised?

In the concluding portion of his paper Mr. Carne discussed briefly possibilities in living rooms, kitchens, bedrooms, and "dual purpose" rooms. It was hoped that the Codes of Practice to be adopted in the future would ensure both the installation of efficient units and the provision of an adequate number of lighting points. It appeared, however, that on the existing economic basis the levels of illumination in the chief living rooms could hardly attain more than half those specified in the I.E.S. Code. Could it be suggested that an additional shilling could be found in the household budget to bring value up to the I.E.S. levels? However strong the claim might appear to be an equally strong case could perhaps be made out for using that shilling to raise the standard of other necessities of life. Higher levels of illumination in the home have, however, always accompanied the use of more efficient light sources. We must therefore look in this direction for substantial advances—though education by precept and example will no doubt lead to higher levels of illumination in the case of those who can afford them.

The Social Value of Good Lighting

In the subsequent discussion several speakers, led by Mr. Ackerley, were inclined to urge that the Society should not attach too much weight to the economic case, but should concentrate on demonstrating the great value of proper lighting. In the future the nation should aim at a social state which would permit these essential conditions to be realised. Mr. R. W. Ames argued that the expenditure during the last five years showed that we could surely afford a little to make our homes worth living in, and Mr. A. H. Owen described a system of fluorescent lighting in his own home which yielded 120 ft.c., and should not prove too costly on the domestic power rate.

Other points emphasised were the value of flexibility in lighting—so that a light could be obtained in turn at a number of places where it was needed, the experience that good lighting often cost no more than bad lighting, and the conception of equipping houses when built with properly designed fittings which would be sold with the house.

Lighting Reconstruction Pamphlets

Many of our readers will doubtless have noted that the Illuminating Engineering Society has been engaged in the production of a series of "Lighting Reconstruction Pamphlets," designed to pave the way for progress in lighting when the war is over.

A considerable amount of work has already been done towards preparing recommendations and codes of practice by committees associated with Government Departments. The moment is therefore judged to be ripe for making these Lighting Reconstruction Pamphlets known, and the first three of the series entitled "Principles of Good Lighting," "The Lighting of Public Buildings," and "The Lighting of Schools," are about to be issued.

Much care has been devoted to the preparation of these pamphlets, which are simply and lucidly worded, excellently printed on matt white paper, and illustrated by appropriate thumbnail sketches. The illustration reproduced at the head of this page strikes us as particularly happy; so, too, does the application in this initial leaflet of the familiar notice, "Bad Light Stops Play," to lighting in other fields.

"Principles of Good Lighting," as the title implies, serves as an introduction. It answers the query, "Why is good lighting necessary?" and discusses in turn light and vision, the essentials of good lighting, and planning ahead.

In the second and third pamphlet we turn to practical application of the ideas suggested in the first. There are notes on the lighting of schools and colleges, public halls, picture galleries and museums, etc. The requirements of schools, both natural and artificial, are discussed in some detail, and a section from the latest edition of the I.E.S. Code is reproduced.

Altogether the Society is to be congratulated on this neat and new effort. And we are sure that there will be many members who will be able to make effective use of them, in approaching local authorities or bodies concerned with the lighting of post-war buildings.

Orders may now be placed for the first three pamphlets. The cost in each case is 1s. per single copy, 9s. per dozen, or 60s. per 100 (post free).

We understand that there will be other pamphlets available in the near future.

Short Cuts in Illuminating Engineering

In a talk to the I.E.S. Huddersfield group on March 14 Mr. W. J. G. Davey explained some of the diagrams and devices used by him in easing lighting calculations, which I.E.S. members have had an opportunity of seeing on several occasions. Dr. J. Whitaker presided. Mr. Davey's technical exposition was enlivened by remarks of definite human interest—as when he explained that though a gas lighting engineer (and proud of it!) he had gladly introduced his charts to the notice of electrical engineers since the outbreak of war. He hoped that this spirit of co-operation, fostered by war conditions, would continue when peace returned.

Colour Blindness In Industry

A meeting of the Colour Group was held at the Royal College of Science on March 8, to discuss the subject of colour deficients in industry. This technical meeting was preceded by the Annual General Meeting of the Group at which the usual formal business was transacted. Owing to the illness of the chairman (Mr. J. Guild) the chair was taken by Mr. G. S. Fawcett. Mr. Guild was re-elected as chairman and Dr. Wright was elected hon. secretary in place of Mr. H. D. Murray who was unable to continue in that capacity. Maj. A. Cornwell-Clyne, Mr. Fawcett and Dr. Schofield were elected to the committee to replace Dr. Buckley, Dr. Harrison and Mr. G. S. J. White who had resigned. The annual report of the committee showed a year of continued activity and an increase in membership.

At the sixteenth science meeting of the group, which followed immediately after the annual general meeting, a progress report of the group's sub-committee on "Colour Deficiency in Industry" was presented by Dr. J. H. Shaxby, the chairman of the sub-committee. It will be remembered that, at a meeting of the group held at the end of 1941 to discuss a paper by Dr. Pitt on this subject (see LIGHT AND LIGHTING, Jan., 1942, p. 7), it was advocated, both by the author and by several speakers in the subsequent discussion, that there should be systematic testing of the colour vision of personnel in industries and professions where ability to distinguish colours was an important matter. As a result of this meeting the group set up a sub-committee to study the whole question.

The first task of the sub-committee, said Dr. Shaxby, was to endeavour to explore the present position, i.e., to collect from a large number of selected industries as much information as possible regarding the extent to which colour testing was carried out already and the nature of the tests generally used for the purpose. There were, of course, certain cases where systematic testing on a well-recognised basis was carried out as a matter of routine (e.g., for certain classes of railway employees), but it was found that, on the whole, only a small proportion of the total number of workers in the selected industries were actually engaged on tasks for which colour-testing was clearly necessary. Most commonly it was found that such tests as were applied were specific trade tests such, for instance, as the discrimination between the coloured strands of a multi-cored cable. The most popular of the recognised general colour-vision tests was the Ishihara, no doubt on account of the ease with which it could be carried out and the fact that no apparatus, other than a set of cards, was required. Exceptional among educational institutions in applying a test was the Edinburgh School of Printing at which all entrants were put through the Ishihara test.

Dr. Shaxby emphasised that the paper was a preliminary to the final report of the sub-committee which was now in preparation. He hoped that it would result in assistance from the general membership of the group towards the collection of further information from branches of industry not so far covered as thoroughly as the sub-committee could wish.

In the discussion which followed various speakers asked Dr. Shaxby questions concerning the proposed contents of the report and its recommendations, e.g., whether there would be any test suggested for use where specially fine discrimination of colours was needed, whether any limits for acceptance as "normal" would be laid down, and so on. Dr. Wright said that the sub-committee felt that it ought to advocate systematic testing in schools with a view to vocational guidance, but he pointed out that for such a recommendation to have any weight it was necessary to show quite clearly that colour-blind people were handicapped in certain types of work.

(There is no doubt that any information regarding industries (a) where colour testing is carried out, or (b) where colour-blindness is a definite handicap, would be welcomed by the sub-committee. It is suggested that readers of LIGHT AND LIGHTING *who can help in this way should communicate with Dr. W. D. Wright at the Royal College of Science, Imperial Institute Rd., S. Kensington, London, S.W.7).*

National Illumination Committee of Great Britain

(Affiliated to the International Commission on Illumination)

Constitution of the Committee on December 31st, 1943

NOMINATED BY THE CONTRIBUTING ASSOCIATIONS:—

Illuminating Engineering Society: R. O. ACKERLEY, DR. H. BUCKLEY, J. S. DOW, DR. S. ENGLISH, L. H. MCDERMOTT.

Institution of Electrical Engineers: LT.-COL. K. EDGCUMBE, P. GOOD, PROFESSOR J. T. MACGREGOR-MORRIS, DR. C. C. PATERSON, J. W. TOWNLEY.

Institution of Gas Engineers: J. E. DAVIS, G. DIXON, E. V. EVANS, F. C. SMITH.

NOMINATED BY THE CO-OPERATING ASSOCIATIONS:—

Admiralty: W. C. M. COUCH.

Air Ministry: C. B. COLLINS, E. C. HYDE.

Association of Public Lighting Engineers: E. J. STEWART.

British Commercial Gas Association: D. CHANDLER.

British Electrical and Allied Manufacturers' Association: C. RODGERS.

British Electrical Development Association: V. W. DALE.

Department of Scientific and Industrial Research: (*National Physical Laboratory*) T. SMITH, DR. J. W. T. WALSH.

Electric Light Fittings Association: G. CAMPBELL, DR. S. ENGLISH.

Electric Lamp Manufacturers' Association: W. J. JONES, C. W. SULLY.

Glass Manufacturers' Federation: E. J. C. BOWMAKER, G. MARCHAND.

Home Office: E. W. MURRAY.

Incorporated Municipal Electrical Association: E. J. JARVIS.

Industrial Health Research Board: H. C. WESTON.

Institution of Municipal and County Engineers: E. J. ELFORD.

Medical Research Council: DR. H. HARTRIDGE.

Ministry of Health: A. SCOTT.

Ministry of Supply: COL. SILVESTER EVANS.

Ministry of Transport: E. S. PERRIN.

Ministry of Works: G. SMITH.

National Gas Council: G. DIXON.

Post Office: SIR HENRY BASHFORD, H. W. FULCHER.

Railway Clearing House: M. G. BENNETT, A. CUNNINGTON.

Society of British Gas Industries: F. J. GOULD, R. J. ROGERS, CRAWFORD SUGG.

Society of Glass Technology: DR. B. P. DUDDING.

OFFICERS:—

Chairman: LT.-COL. K. EDGCUMBE.

Vice-Chairmen: DR. C. C. PATERSON and F. C. SMITH.

Hon. Treasurer: Dr. C. C. PATERSON, Research Laboratories of the General Electric Co., Ltd., Wembley Middlesex.

Hon. Secretary: L. H. MCDERMOTT, The National Physical Laboratory, Teddington, Middlesex.

Representatives of Great Britain on the Executive Committee of the International Commission on Illumination:—

LT.-COL. K. EDGCUMBE and DR. H. BUCKLEY.

National Illumination Committee of Great Britain

(Affiliated to the International Commission on Illumination)

Annual Report for the Year 1943

(Presented at the Annual Meeting of the Committee held on Tuesday, March 14th, 1944)

At the special annual meeting held in March, the committee learned with regret of the resignation of Mr. W. J. A. Butterfield, who had been an active member of the committee for forty years. He attended the first meeting in December, 1913, and had been the hon. treasurer throughout his period of membership, as well as being the hon. secretary for the first ten years, and vice-chairman since 1936. An expression of the warm appreciation of the members for his long and untiring efforts on behalf of the committee was accorded to Mr. Butterfield.

Dr. Paterson was elected to fill the vacancy in the office of hon. treasurer, and Mr. F. C. Smith was appointed to the position of vice-chairman. Other changes of representation consequent upon Mr. Butterfield's resignation are that Mr. F. C. Smith now represents the Institution of Gas Engineers, and Mr. George Dixon the National Gas Council in place of Mr. Smith.

The committee regrets to have to record the death of Mr. Stephen Lacey who has represented the Institution of Gas Engineers since 1935.

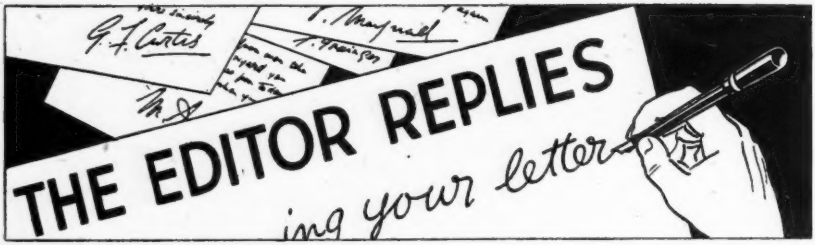
Mr. A. C. Cramb, who represented the British Electrical Development Association since 1931, has, on retirement, been followed by Mr. V. W. Dale, while for the same reason Mr. T. E. Ritchie has, after a period of membership of seventeen years, given place to Dr. S. English as the representative of the Electric Light Fittings Association. Mr. A. W. Beuttell has also resigned from the committee after being a member for nine years, Mr. R. O. Ackerley being appointed in his stead by the Illuminating Engineering Society.

Although it has not yet proved possible to recommence the activities of the committee, active steps are now being taken in connection with subjects which are of interest to the committee, principally from the point of view of international standardisation. Mr. P. Good, as director of the British Standards Institution, has recently visited the U.S.A. and discussed the question of standardisation among the United Nations, with special reference to the question of visual aids-to-movement in the air.

Dr. H. Buckley has also visited the U.S.A. and was for five months on the staff of the British Central Scientific Office as liaison officer in general physics on behalf of the Ministry of Production.

During the year, the British Standard Specification for miners' lamp bulbs has been revised by the inclusion of the 2.5 volts 1.75 amps. and 4.0 volts 0.55 amps. ratings and in the cinematograph section a specification for studio spot light lamps has been issued. Several of the photometric specifications are undergoing revision.

K. EDGCUMBE, *Chairman.*



Mr. Carne's recent I.E.S. paper (see pp. 50-51) raises fundamental questions and has naturally excited some comment. How far, in fixing values for a **Code of Lighting,** should one be influenced by considerations of economy? Should one aim at specifying what is *necessary*, or *desirable*, or *practicable*?

I do not think one can give a rigid answer. Except when we define with great precision the purpose the light is to serve we cannot conscientiously declare what is necessary—and even so, as indicated in Mr. Weston's recent paper, we have to decide on some fraction of ideal performance (perhaps 90 or 95 per cent.) and work to that. How much light people are prepared to pay for depends primarily on the cost of lighting, which, fortunately, has diminished greatly during the present century.

The I.E.S. Code only professes to give values based upon **"good modern practice."** This doubtless applies to the values given for **Home Lighting,** which all I.E.S. members would doubtless be prepared to adopt, whilst some (like Mr. Owen) are willing to go far beyond them. But the "homes for the million," occupied by people with small incomes, who may actually be unable to afford even the necessary minimum, present a real difficulty. "Good working practice" is scarcely ever attained. The solution would seem to be social rather than technical in this case.

Whilst referring to the Code I am reminded of a recent contribution to the "Philosophical Magazine" by Mr. A. F. Dufton. In commenting on Mr. Weston's paper, he recalls Mr. Peter Simple's note on **"The Duple: a Logarithmic Unit"** and his further derivation therefrom of the **"tootha"** ("two to the power of"). There is a suggestion of hilarity about this term, which Mr. Dufton persuasively offers us. I suspect, however, that the rank and file of illuminating engineers may feel that its simplicity is less evident than the name of its originator might suggest.

I have been favoured by the British Standards Institution with a copy of the War Department **Specification for Blackout Flashlights, Lanterns and Flares** issued by the U.S. Office of Civilian Defense. The specification is concerned mainly with flashlights, though an approved method of masking a typical lantern is also illustrated. Flashlights are to be dimmed by a standard plastic disc (though, pending its production, the familiar improvisation of using layers of newspaper was sanctioned).

An interesting point in the specification is that the screen is apparently intended to emit only **orange or orange-red light,** and directions are given for its testing in a dark room in order to ensure that substantially no blue light is emitted. In this respect the specification is curiously at variance with the usual initial tendency in blackouts to make use of blue light—though in this country expert opinion now seems to favour the view that on the whole ordinary "white" light is best.

Dr. J. H. Nelson tells me of a rather curious experience in connection with

the fitting up of two special test rooms, one in London with a **ceiling height of 10 ft.**, the other in Birmingham with a 15 ft. height. Immediate sanction for fluorescent lamps was obtained in London, but in Birmingham there was firm refusal on the ground that such an installation would be ridiculously wasteful!

The authority concerned was certainly bold in taking this decision, which could hardly be sustained under expert advice. Installations of fluorescent lamps with ceiling at heights of 15 ft. or over are quite familiar and satisfactory—indeed, there is a good deal to be said, from the standpoint of eye-comfort, for mounting **direct on the ceiling** rather than at a relatively low small distance above the working plane.

The case is instructive because of the deep-rooted belief that **increased mounting height** necessarily involves **loss in efficiency**. Reasoning on the "inverse square law" basis might lead to the expectation in the above case that the illumination would be rather more than halved by the increase in mounting height. But in practice this is not so. *First*, with 5 ft. fluorescent lamps direct illumination diminishes with distance less rapidly than the inverse square law would suggest. *Secondly*, when full use is made of reflection of light from walls and ceiling, so that the indirect component is considerable, the effect of distance is less still; in some installations, indeed, where the actual source of light resembles a luminous plane, distance does not diminish the illumination very materially. *Thirdly*, there is always the possibility of counteracting a greater mounting height by the adoption of reflectors having a more concentrating effect—though this method is not so potent with fluorescent lamps as it is with filament units.

I still receive, from time to time, particulars of cases, very unusual, in which **complaints of eye-trouble** have been made by workers using **fluorescent tubes.** As already indicated (see p. 26, Feb., 1944) I believe that this trouble is usually associated with **misuse of the lamps**—for example, when their installation results in a very high background brightness, possibly much greater than that of the objects being inspected. Dr. Nelson has sent me a sketch illustrating the undue brightness of a light painted conveyor-hood, which caused trouble in this way.

It may be taken as an almost invariable rule that the brightness of a background should never greatly exceed that of the work (except possibly in exceptional cases in which "silhouette-vision" is utilised). But apart from this it seems just possible that the **exposure** to the eye of an exceptionally **bright surface** subtending **a considerable angle** may cause discomfort—especially if much of the light **enters the eye from below.**

I have in mind the expression of this idea many years ago in "the Art of Illumination" by Dr. Louis Bell, who mentioned a simple device adopted by the Red Indians in snowfields—the cutting out and folding over of semi-circles in **"paper spectacles,"** so that the eyes were screened from radiation reflected upwards from adjacent snow. This might be regarded as a protection against ultra-violet light, but in the brilliant sunshine at high altitudes protection from intense visible light is also desirable.

It can be argued that the central region of the retina is designed for sustained vision and is well adapted to endure variations in brightness of a high order, whereas the peripheral regions operate chiefly at relatively low illuminations. The brow screens the eye to a great extent from light entering from above. But the *protection from light coming from below* is less perfect. This would explain in some degree the experiences of draughtsmen who sometimes find that constant examination of large areas of brightly lighted drawing paper fatigues the eyes.

I.E.S. Development:

Past Experiences and Present Prospects

In an address delivered to the I.E.S. Leicester Group on March 7 Mr. E. Stroud dealt mainly with floodlighting and street-lighting, but he also took the opportunity to draw attention to the phenomenal growth of the Society during recent years. He recalled its formation in 1909, when about eighty original members were collected. Mr. Stroud stated that he himself had been a member since 1913, and mentioned the names of a number of the original members who still take a keen interest in the affairs of the Society. By 1913 the number had risen to 350, but it was not until about 1939 when this number had been approximately doubled that the remarkable advance to the present number (about 1,500) began. He also quoted some figures for the membership of the various Centres, indicating that they together furnished nearly two-thirds of the total membership, and emphasised the importance of their contribution to the work which the I.E.S. is doing.

After referring to the important step of conferring the distinction of Fellowship on I.E.S. members having the requisite qualifications, Mr. Stroud reviewed briefly some of the Society's war-time activities, which had resulted in a number of specifications dealing with A.R.P. lighting problems. He also recalled the steps leading to the issue of the fifth report of the Departmental Committee on Lighting in Factories, on which prominent I.E.S. members had taken an active part.

Since the outbreak of the war the great increase in the number of Centres and Groups has resulted in the number of meetings held during the year being even greater than in pre-war days. Mr. Stroud recalled, however, the very successful additional meetings of the "Special Sections" devoted respectively to photometry, industrial lighting, public lighting, decorative lighting, and commercial lighting organised in London in pre-war days. It was hoped that these activities would be resumed after the coming of peace.

In connection with floodlighting, the lecturer gave some of his experiences in connection with the wonderful display in 1931, on the occasion of the I.C.I. Conference, showing a number of slides of typical installations.

The concluding part of the address dealt with street-lighting, and pre-war developments therein, such as the work of the B.S.I. Committee and the Report of the Ministry of Transport. Mr. Stroud gave a summary of this report, alluding to several debatable points therein, such as the somewhat drastic division of roads into "traffic routes" and "other roads" and the corresponding specification of two heights of posts, 25 ft. and 13-15 ft. respectively. In this connection he suggested a division of "Group B" roads into five classes, with progressively diminishing intensities and corresponding diminutions in mounting height.

The importance of a clear understanding in regard to post-war practice in street-lighting, and the desirability of something in the nature of an "I.E.S. Code" for the guidance of local authorities, was pointed out.

Natural Lighting and Hygiene

At the present moment, when so much attention is being devoted to the design of post-war buildings and the admission of daylight and the application of daylight factors, the question is often raised how far natural lighting is really essential in the interests of health. Most of us have a liking for daylight and would be reluctant to live continuously in windowless buildings. There is also a general belief that the entry of sunlight, and especially ultra-violet radiation, has a valuable germicidal action—thus confirming the old saying: "Where the sun does not enter the doctor comes."

On the other hand there have been some who assert that if buildings are properly lighted artificially, and well ventilated, heated, and air-conditioned, they should be quite hygienic, and that in congested city areas one might dispense with windows, light-wells and other devices for the admission of daylight, often extremely difficult to secure in such circumstances.

A recent research reported by Dr. L. P. Garrod,* which has been brought to our notice by Mr. H. C. Weston, is therefore of great interest. It not only demonstrates definitely the value of light in destroying streptococci, but also establishes the fact that "ordinary diffuse daylight, even on a cloudy day and even in winter in England, can be lethal to bacteria, and that glass is no absolute bar to this effect."

In view of this conclusion the further question arises whether artificial light, can also exercise this beneficial function and whether any appreciable difference between different forms of artificial light exists. It might conceivably be found that the effect is less potent, or that artificial light is only comparable to daylight in this respect when of similar intensity; or that, we could "energise" our artificial light beneficially by including a small but definite proportion of ultra-violet radiation of the requisite wavelength. We should very much like to see the research continued on these lines.

In what follows we give a summary of Dr. Garrod's contribution:—

Samples of floor dust were examined from three ground-floor and three first-floor hospital wards. The windows of the ground-floor wards were almost completely bricked up and these wards were therefore very badly lighted, whereas the first-floor wards were well lit. Cases of haemolytic streptococcal infection had occurred in all the wards, but there was a very marked difference between them in the findings of streptococci in the floor dust. Thus, of seventy-six samples from the ground-floor wards, 72 per cent. contained viable streptococci, while of thirty-three samples from the first-floor wards the corresponding percentage was only eighteen. It is admitted that the two sets of wards were not strictly comparable, either in the circumstances prompting the investigation, or in the type of case treated, but the difference between them was so marked as to suggest the overriding operation of one factor, and one possible factor appeared to be light.

Evidence capable of the same interpretation was obtained at the same time in a different way. Dust was collected not only from the floors, but from other surfaces on which it accumulated. The thickest dust was found on the black-out

*"Some Observations on Hospital Dust, with special reference to light as a hygienic safeguard." L. P. Garrod, M.D. F.R.C.P. (Prof. of Bact., Univ. of Lond. Bact. to St. Bart's Hosp.) Brit. Med. Jour. No. 4337, Feb. 19, 1944. p. 245-247.

screens. Samples were examined from these screens and from the upper surface of the lower sashes of the windows. None of these was found to contain haemolytic streptococci. Dust samples were taken from sites intermediate in level between the window and floor, viz., skirting and low shelves. Forty-one per cent. of these contained viable streptococci. Further samples (109 in all were taken from the floor and of these 56 per cent, gave positive findings. Thus, dust on or close to the windows, and so exposed to maximum light, was consistently free from haemolytic streptococci, whereas these were found in a considerable percentage of the samples from the intermediate levels, and in a still higher percentage of the samples from the floor, which received least light.

Because dust is an inconstant and difficult material to work with, further information about the action of daylight on streptococci was sought by experimenting with films of dried pus. These were placed in Petri dishes and sets were kept in four situations, viz., (1) the ledge immediately inside a first-floor laboratory window facing south, (2) a similar position inside a window facing north and receiving no direct sunlight, (3) a dark cupboard in the same laboratory, (4) a refrigerator at about 4 deg. C. Cultures were made from the films at lengthening intervals. The results showed that the streptococci died most rapidly in a position exposed to sunlight although this had to traverse two layers of ordinary glass (the window and the Petri dish); survival was longest in the experiment started in November, i.e., when there was less sunlight and daylight than during other experimental periods. Diffuse daylight from the north window was lethal within thirteen days or less, but in the dark cupboard the streptococci survived for many weeks, as they did also in the refrigerator.

In further experiments infected dust, collected by vacuum cleaner and filtered through gauze to remove coarse particles, was exposed indoors to north daylight, samples from the same collection being also kept in the dark. Streptococci in the fine dense dust yielded by this method survived much longer in daylight (about 2½ months), but survival in the dark was for the longest period on record—6½ months.

These observations are reported in order to draw attention to the possible importance of good natural illumination as a hygienic safeguard, and in the hope that they may lead to further study of this subject. Although good lighting is universally recognised as desirable, it has never, so far as the author is aware, been insisted on as a prime necessity in wards for septic surgical cases. This study suggests that in such wards it has an important part to play; particularly if no special measures (such as the oiling of bed-clothes and vacuum dust extraction) are taken to prevent the atmospheric diffusion of dust. It has been shown that haemolytic streptococci naturally present in dust will survive for over six months in the dark. It was noticeable that dark corners on the floors of infected wards were always more liable to yield dust containing haemolytic streptococci than more open situations; one dark recess beneath a bookcase was repeatedly sampled and never failed to yield them. Prolonged ward epidemics with long intervals between fresh cases are readily explicable in such conditions. It was also found that dust on or close to windows never contained haemolytic streptococci, whether exposed to direct sunlight or not. Whether this is an effect of light, or is partly or wholly explicable on other grounds can only be settled by further observations. Pre-occupation with the U.V. part of the spectrum has led to a common belief that only direct sunlight is usefully bactericidal; it must now be recognised that ordinary diffuse daylight, even on a cloudy day and even in winter in England, can be lethal to bacteria, and that glass is no absolute bar to this effect. The conditions governing this type of light effect would evidently repay further investigation from several points of view.

The facts disclosed in this investigation suggest the possibility that good natural lighting may be a factor in preventing the atmospheric spread of infection in surgical wards and elsewhere.